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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,436	03/30/2004	Charles R. Pellegrino	N001-5257	3365
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ADAMS & WILKS 17 BATTERY PLACE SUITE 1231 NEW YORK, NY 10004			EXAMINER UNDERDAHL, THANE E	
			ART UNIT 1651	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/812,436	<b>Applicant(s)</b> PELLEGRINO ET AL.	
	<b>Examiner</b> Thane Underdahl	<b>Art Unit</b> 1651	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 2/22/07.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-9, 11 and 16-19 is/are pending in the application.
- 4a) Of the above claim(s) 16-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

DETAILED ACTION

***Response to Applicant's Arguments***

***Response to Applicant's Arguments— 35 U.S.C § 112***

In response to the Applicant's argument against the rejection of claims 7, 8 and 9 as being indefinite. This rejection is dropped in view of applicant's amendment.

***Response to Applicant's Arguments— 35 U.S.C § 102***

In response to the applicants argument against the rejection of claims 1-3, 8 and 9 as being anticipated. This rejection is dropped in view of applicant's amendment.

***Response to Applicant's Arguments— 35 U.S.C § 103***

In the response submitted by the applicant on 2/22/07, the 35 U.S.C § 103 (a) rejection of claims 4, 5, and 7 over Iverson as supported by Jones, Cullimore et al. and Kalmykov et al. is dropped in view of applicant's amendment.

In the response submitted by the applicant on 2/22/07, the 35 U.S.C § 103 (a) rejection of claims 6 over Iverson (Proc, 1973) and Iverson (IBB, 2001) in further view of Felkins (JOM, 1998) with additional support from Metal Suppliers Online ([www.suppliersonline.com](http://www.suppliersonline.com)) is dropped in view of applicant's amendment.

In the response submitted by the applicant on 2/22/07, the 35 U.S.C § 103 (a) rejection of claim 11 over Iverson, ACE-27 and Genny Anderson were considered but not found persuasive.

The amended claim 1 from which claim 11 now depends further limits that the growth substrate for the rusticle consortia (**RC**) is placed in a tank filled with an aqueous

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solution comprising water containing oxygen and a nutrient substance containing ferric ammonium citrate and inorganic nutrients.

While Iverson does not mention specifically that his setup contains oxygen one of ordinary skill in the art would recognize that the setup has water that contains oxygen. Furthermore since Iverson is performing corrosion studies on metal the solution will inherently contain oxygen since the reduction of  $O_2$  is an inherent half reaction for corrosion. Also Iverson mentions no step in his procedure that oxygen was purged from the system. Given the detail and importance of describing such a step in the experimental setup one of ordinary skill in the art would recognize that oxygen is indeed in the aqueous solution of Iverson's experimental setup.

The applicant further argues that their composition requires ferric ammonium citrate. While it is true that the artificial seawater used by Iverson does not contain ferric ammonium citrate but ferrous ammonium sulfate. However as mentioned in the action another formula for artificial seawater is ACE-27 and it contains ferric citrate. Since both salts are used as media for artificial seawater it would be obvious to one of ordinary skill in the art to combine the salts since they both are known for the same purpose (M.P.E.P. § 2144.06) in such an event through dissociation and re-association of the ion pairs of the salt it is obvious that ferrous ammonium sulfate would be present in the solution. Furthermore ferrous ammonium citrate and ferrous citrate are very close in structural similarity that one of ordinary skill in the art would recognize that they will have similar properties (M.P.E.P. § 2144.09) in the absence of evidence of criticality to

the contrary since the ammonium only serves as a counter ions to the ferrous citrate complex.

Also the Examiner is confused as to the argument that Anderson does not disclose an aqueous solution between 7.4 and 8.4. Anderson discloses the pH of seawater is between 7.5 and 8.5. A pH of 7.5 is clearly within the range of a pH of 7.4 to 8.4. Therefore the rejection stands and is repeated below.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 11 remains and amended claims 1-3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iverson (Proc, 1973 in view of ACE-27 (<http://faculty.washington.edu/mandoli/methods/media/estocks.html>, 2002) as supported by Genny Anderson (<http://www.biosbcc.net/ocean/marinesci/02ocean/swcomposition.htm>) and additional support from Iverson (IBB, 2001).

Claims 1-3, 8 and 11 are drawn to a method to produce a mass culture of rusticle consortia (**RC**) by providing a growth substrate, placing a sample in the growth substrate and putting it in an aqueous solution which has a controlled environment that facilitates RC growth. The aqueous solution comprises water, oxygen and a nutrient substrate containing ferric ammonium citrate and inorganic nutrients. Further limitations

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include that growth substrate is an anodically charged metal which can be a metal plate. The metal plate is embrittled. Also claims 8 requires the metal plate be made of unlike metals. The final pH can be in a range of 7.4 to 8.4

Iverson et al. teach a method of culturing *Desulfovibrio* on Mild Steel plates.

These icicle-like structures are referred to as rusticles and are the same as those found on the Titanic as supported by Iverson (IBB, 2001, col 1 page 67 Rusticles or Stalactites) so these microorganism meet the definition of RC.

The RC is cultured by placing a mild steel electrode (metal plate) in a culture medium that is inoculated with *Desulfovibrio* cultures in conditions suitable for their growth (Iverson, Proc. Page 63-64 Electrochemical cell). The metal plate is anodically charged (Iverson, Proc. Page 77, Figures 6 and 7).

Iverson uses cold rolled 1020 steel as the metal plate in his experiments. This is an alloy that contains amounts of unlike metals such as Manganese and Phosphorus as supported by Metal Suppliers Online.

Iverson (Proc, 1973) teach the culturing the RC in an artificial seawater medium containing inorganic nutrients and ferrous ammonium sulfate. However Iverson does not teach the use of ferric ammonium citrate. However another artificial seawater composition ACE-27 uses Fe-citrate. While they do not specifically teach iron ammonium citrate one of ordinary skill in the art would recognize that ferric citrate is sold as ammonium ferric citrate. One of ordinary skill would be motivated to use the ammonium salt because the end solution if it is to mimic seawater should have a pH between 7.5-8.5 as supported by Genny Anderson (page 7 to 8) and the addition of

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ammonium would reduce the amount of base to be added to adjust the seawater to the alkali pH. It would also add another buffering component to maintain the pH.

It would have been obvious to someone skilled in the art to alter the artificial seawater of Iverson with the artificial seawater of ACE-27. The motivation is provided by ACE-27 whose artificial seawater chelates iron to provide better solubility at an alkali pH. It would also be obvious to adjust the pH of the solution to the range of 7.5 to 8.5 since that is the natural pH of seawater. The reasonable expectation of success is provided by Iverson who already cultured RC in artificial seawater. Therefore the references listed above renders obvious claim 11 as well as amended claims 1-3 and 8.

***New Rejections Necessitated by Applicant's Amendment***

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 7, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iverson (Proc, 1973) as applied to the claims above in view of ACE-27 as applied to claims 1-3, 8 and 11 above, and further in view Iverson (IBB, 2001) and Kalmykov et al. with additional support from Jones and Cullimore et al.

The description and rejection of claims 1-3, 8 and 11 are listed in the 35 U.S.C § 103(a) rejection above. Claims 4, 5 and 7 are drawn to the embrittling of the metal plate

via hammering it at 3000 p.s.i. for 60 minutes or rolling the plate to promote the formation of lateral pearlite deposits to cause a flaking form of corrosion.

Iverson (Proc., 1973) teach that the culturing of RC is a corrosion reaction between the metal and the *Desulfovibrio* that comprises the RC (see Abstract). Iverson (IBB, 2001) teach that the corrosion cell with *Desulfovibrio* is similar to a typical corrosion cell. Iverson (Proc., 1973) teach that the corrosion rate increases (page 77, Figures 6 and 7) as the RC propagates and increases in size (page 66 paragraph 1). In other words as corrosion of the metal plate increases the RC culture reproduces and so one of ordinary skill in the art would recognize that increasing the corrosion rate will increase the culture size of the RC. Therefore it would be obvious to one of ordinary skill in the art to increase the corrosion rate of the metal. Jones et al. teach that increasing defects in the metal surface disrupts the protective metal passive layer and increases the corrosion rate (Jones, page 8-9 Passivity). One of ordinary skill in the art would recognize that any common event that disrupts the passive layer will increase the corrosion rate and thus the size of the RC. Since the passive layer is thin and fragile applying force via scratching removes the layer and increases the metals susceptibility to corrosion (as supported by Jones page 116-119, Passive Films). Iverson (Proc 1973) removes the passive layer from his samples via sanding (page 63, Electrochemical Cell). One of ordinary skill in the art would realize that abrasion as well as hammering (rust forming in a car dent) or rolling (stress corrosion cracking) the substrate will also disrupt the passive layer and accelerate corrosion.



One of ordinary skill in the art would recognize that rolling steel produces an increase in the pearlite component of the steel and increase the corrosion rate as supported by Kalmykov (page 291, line 1-3). Therefore, one of ordinary skill in the art would recognize that rolling the steel increases the corrosion rate and that an increase in corrosion rate will translate into increases into the size of the RC.

Hammering the steel will embrittle and disrupt the passive layer allowing fresh active sites for corrosion to occur and thus active sites for RC propagation. One of ordinary skill in the art would also know that the RC that are found growing on the infamous cruise ship Titanic are under 5950 PSI (41,000 KPa) as supported by Cullimore et al. (page 123 1<sup>st</sup> full paragraph). So it would be *prima facie* obvious to one skilled in the art to hammer the metal with high force to disrupt the passive layer to increase the number of active corrosion sites to increase the size of the RC culture.

While the references listed above do not specifically teach the limitation of 3000 psi as seen in claim 5, one of ordinary skill in the art would recognize the force applied to hammering the steel to disrupt the passive layer is a result effective variable. Absent any teaching of criticality by the applicant concerning the force listed in claim 5 it would be *prima facie* obvious that one of ordinary skill in the art would recognize that the pressure listed in claim 5 is a result effective variable which is a matter of routine optimization.

In summary it would have been obvious for the person of ordinary skill in the art to deform the metal substrate when culturing RC to remove the passive layer and expose more active sites for corrosion to occur. One of ordinary skill in the art would

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recognize that deforming the substrate could be from abrasion (as taught by Iverson), rolling (as taught by Kalmykov) or hammering. Each of these techniques is well known to accelerate corrosion and since the formation of RC is a corrosion process one of ordinary skill in the art would be motivated to accelerate corrosion to accelerate the growth of RC. Iverson (Proc, 1973) provides reasonable expectation of success since he did grow RC in a corrosive environment.

Therefore the references listed above renders obvious claims 1-5 and 7, 8 and 11.

Claims 1-3, 6, 8 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iverson (Proc, 1973) with support from Iverson (IBB, 2001) in view of ACE-27 as applied to claims 1-3, 8 and 11, and further in view of Felkins (JOM, 1998) with additional support from Metal Suppliers Online ([www.suppliersonline.com](http://www.suppliersonline.com)).

The description and rejection of claims 1-3, 8 and 11 are listed in the 35 U.S.C § 103(a) rejection above.

Claim 6 is drawn to the method of claim 3 but limits the metal plate to a chemical composition of at least 0.8% phosphorus, 1.2% sulfur and 1.4% manganese. Iverson (Proc, 1973) teaches the use of mild steel 1020 to grow RC. This has a composition of 0.04 % phosphorus, 0.05% sulfur, and .6% manganese.

Iverson (IBB, 2001) uses steel 1010 which has the same composition of the above metals as 1020. Felkins teach (Table II) that the steel on the Titanic, which grows RC, has a composition of 0.045 % phosphorus, 0.069% sulfur, and .47% manganese.

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While none of these meet the limitations of the amounts of the above metals M.P.E.P. §

2144.05 II states:

Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical.

Furthermore, the M.P.E.P. § 2145.05 state:

“a *prima facie* case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties.”

Absent any teaching of criticality by the applicant concerning the amounts listed in claim 7 for the method of claim 3, it would be *prima facie* obvious that one of ordinary skill in the art would recognize that the amounts listed in claim 7 are result effective variables whose ratio and concentration are a matter of routine optimization.

Therefore the references listed above renders obvious claims 1-3, 6, 8 and 11.

Claims 1-3, 6, 8, 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iverson (Proc, 1973) with support from Iverson (IBB, 2001) in view of ACE-27 as applied to claims 1-3, 8 and 11 above, and further in view of Hadfield (Proc. Of the Royal Society of London, 1922).

The description and rejection of claims 1-3, 6, 8 and 11 are listed in the 35 U.S.C § 103(a) rejection above.

Claim 6 limits that the unlike metals in claim 8 are Fe and Cu. Iverson teach the use of mild steel to grow the RC. Regardless this would be obvious to one of ordinary skill in the art by the time the invention was made in view of the teachings of Hadfield.

He teaches that mild steel often contains trace amounts of copper in its alloy composition (Hadfield page 476, Table 1). Given the low amounts of copper in the mild steel alloys taught by Hadfield compared to the substrates used by Iverson and those claimed by the Applicant have close structural similarity. The M.P.E.P. § 2144.09 states:

*"A prima facie case of obviousness may be made when chemical compounds have very close structural similarities and similar utilities"*

Absent any evidence of criticality to the contrary one of ordinary skill in the art would expect the same results for the mild steel used by Iverson to that claimed by applicant.

Therefore the references listed above renders obvious claims 1-3, 6, 8, 9 and 11.

In summary no claims, as written, are allowed for this application.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

**In response to this office action the applicant should specifically point out the support for any amendments made to the disclosure**, including the claims (MPEP 714.02 and 2163.06). Due to the procedure outlined in MPEP § 2163.06 for interpreting claims, it is noted that other art may be applicable under 35 U.S.C. § 102 or 35 U.S.C. § 103(a) once the aforementioned issue(s) is/are addressed.

Applicant is requested to provide a list of all copending U.S. applications that set forth similar subject matter to the present claims. A copy of such copending claims is requested in response to this Office action.

#### CONTACT INFORMATION

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thane Underdahl whose telephone number is (571) 272-9042. The examiner can normally be reached during regular business hours, 8:00 to 17:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Wityshyn can be reached at (571) 272-0926. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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published applications may be obtained from either Private PAIR or Public PAIR.

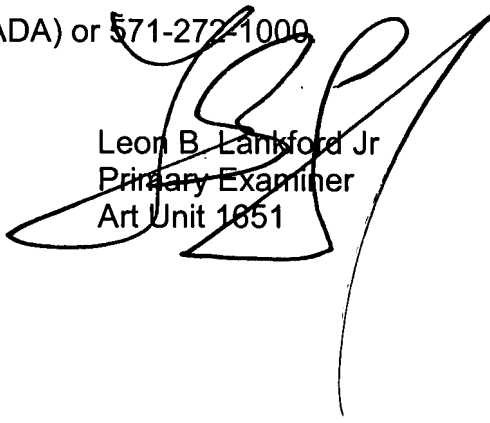
Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic

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system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thane Underdahl  
Art Unit 1651



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